



# **RRS and MicroART File Formats NCDC Archive**

## **Attachment B**

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## **1.0 RRS File Formats**

The following information details the RRS File Formats necessary for NCDC Archive.

## 1.1 RRS Data Products

The RRS software will create and transmit one or more high-resolution data products and archives, in addition to the WMO coded messages. These data products reflect the information in a flight and are disseminated for storage, analysis, and forecasting. The archives include both the raw base data entering at each interface and the refined data after NWS processing has been applied. The following high-resolution data products and archives are created:

- \* NCDC Archive
- \* Distributed Data Set (DDS)

Both data products use the same format (section 2) but are sent at different times, to different destinations.

The NCDC Archive is sent to a specific destination (NCDC); the DDS products are broadcast to the AWIPS network for all to use. Some of these products created will optionally be storable on hard media for delivery via the postal service or other similar delivery service rather than electronic transmission. All electronic transmission of data products will occur from RRS through a modem connection or a LAN connection using FTP or SFTP.

### 1.1.1 NCDC Archive

The high-resolution portion of the NCDC Archive product contains multiple datasets, in the **Binary Universal Form for the Representation of meteorological data** format (BUFR). This NCDC product contains all parameters listed in the individual datasets in section 2.

The RRS software generates this data product after flight termination as a file and optionally archives the data product to hard media. The data product file is currently sent manually via FTP specifically to NCDC, bundled (ZIP'd) with the low-resolution NCDC archive (equivalent to MicroART's). In a later build, the product file may be sent automatically to NCDC. The handling of the NCDC archive will be dependent on the station configuration (e.g., Internet bandwidth).

### 1.1.2 Distributed Data Set (DDS)

The DDS is a high-resolution product, containing multiple datasets, in the **Binary Universal Form for the Representation of meteorological data** format (BUFR), with an AWIPS WMO header. The DDS product will contain all parameters listed in the individual datasets in section 2.

The DDS is used as a means to convey subsets of the above NCDC archive data in near real-time via LDAD to AWIPS, the NWSTG, and NCEP, twice per flight. The first generation or

transmittal of this product by RRS will occur once the radiosonde reaches the 70 hPa (configurable) level and will contain all data from surface up to and including the 100 hPa level. The second generation or transmittal will occur when the flight terminates and will contain all data from surface up to termination. If the flight terminates prior to 70 hPa, the transmittal will contain all data from surface to termination, resulting in a single DDS generation for the entire flight.

If a flight terminates before 400 hPa (unsuccessful flight), the DDS is not transmitted unless the operator selects the flight for product transmission (coded messages and DDS). If a flight is omitted or missed, such that the operator transmits a “no data” coded message, no DDS is transmitted.

Note: if the operator marks or unmarks certain data for exclusion, or modifies the release time or surface observation values, the second DDS generation may contain slightly different processed data values from surface to 100 hPa than are in the first generation. There is no flagging of changed values between DDS generations.

Note: in general, the DDS products are sent whenever coded messages (Parts A, B, C, D) are sent, which could be multiple times per flight, including prior to 100 hPa (if early transmission is requested by the operator). No DDS is transmitted at the time of the RADAT message transmission.

The pre-termination product(s) is distinguished from a completed flight version by a blank “Flight termination” group in the Administrative dataset. Once the flight has terminated, any DDS transmission would contain a “Flight termination” group with all fields filled in.

The “Number of archive recomputes” **ARRE** field is also used for a DDS nth-generation version number 0-99. The number will be incremented with each DDS generation and/or archive product rework generation.

## 1.2 Data Product Datasets Content

The high-resolution data products contain multiple datasets, in the **Binary Universal Form for the Representation of meteorological data** format (BUFR). The high-resolution products will contain all parameters listed in the specific individual datasets below.

- \* Administrative Data
- \* Time stamped raw PTU data (~1-2sec)
- \* Time stamped raw GPS data (unsmoothed) (~1sec)
- \* Time stamped raw GPS data (smoothed) (~1sec)
- \* Time stamped processed pressure, temperature, and humidity (PTU) data (1sec)
- \* Time stamped processed u & v winds and position data (1sec)
- \* Time stamped Levels data

The following seven sections describe the seven datasets of the high-resolution products. Each section describes the constituent data variables and includes their BUFR mnemonics (and any code-table prefix or suffix modifiers) in small caps, e.g. **ICLX**, for cross-reference.

### 1.2.1 Administrative Data (NC002019)

The following administrative data (or “meta” data) is included in each high-resolution product.

RRS-site call letters:	<b>DATSIG ICLX</b>	4-letter ICAO symbol, capitalized
WMO block number:	<b>WMOB</b>	1 - 99
WMO station number:	<b>WMOS</b>	1 - 999
WBAN number:	<b>WBAN</b>	5-digit number
CCCC call letters of “Responsible WFO”:		(either the RRS-site or its parent site)
	<b>DATSIG ICLX</b>	4-letter ICAO symbol, capitalized, part of AWIPS Identifier
XXX (FAA) call letters:		<b>SSTN</b> 3-character symbol, capitalized, part of AWIPS Identifier
Observer initials:	<b>OBSVR</b>	4-character string, space-fill
Version number of workstation software:	<b>SOFTV</b>	“###.###.###.###” (12-character string, space-fill)
Number of archive recomputes:	<b>ARRE</b>	0 - 99
Ascension number:	<b>RASCN</b>	1 - 999 (allow for 9999 extension)
Release number:	<b>RRLSE</b>	1 - 3
Release date:	<b>DATSIG TIMEST</b>	mm/dd/yyyy (UTC)
Release time:	<b>TIMEST</b>	hh:mm:ss.xx (UTC) [.01 seconds]
Release point latitude:	<b>CLATH</b>	0E to 90E N/S [0.00001E] [-90E to +90E]
Release point longitude:	<b>CLONH</b>	0E to 180E E/W [0.00001E] [-180E to +180E]
Release point elevation:	<b>HEIT</b>	-100 to 3000 meters, above MSL [Integer]
Barometer elevation:	<b>HBMSL</b>	-100 to 3000 meters, above MSL [Integer, or 0.1 m if avail.]
Radiosonde type:	<b>RATP</b>	Code Table 3-1
Radiosonde serial number:	<b>RSERL</b>	20-character string, space-fill
Radiosonde sensors used:	<b>PSENS</b>	Code Table 3-2
	<b>TSENS</b>	Code Table 3-3
	<b>RHSENS</b>	Code Table 3-4
Operating radio frequency:	<b>RFREQ</b>	403 MHz or 1680 MHz [0.1 MHz]
Ground receiving system:	<b>RGRSY</b>	Code Table 3-5

Tracking technique:	<b>TTSS</b>	Code Table 3-6
Surface weather observation:	<b>DATSIG</b>	
Pressure:	<b>PRES</b>	700.0 to 1070.0 hPa [0.1 hPa = 10 Pa]
Temperature:	<b>TMDB</b>	-100.0 to 50.0EC [0.1EC]
Relative Humidity:	<b>REHU</b>	0.0 % to 100.0 % [0.1 %]
Wet-bulb Temp:	<b>TMWB</b>	-100.0 to 50.0EC [0.1EC]
Dewpoint Temp:	<b>TMDP</b>	-100.0 to 50.0EC [0.1EC]
Temp 12hrs ago:	<b>TPHR</b>	<b>TMDB</b> -100.0 to 50.0EC [0.1EC] (or 99.9 if missing)
Wind direction:	<b>WDIR</b>	1E to 360E (integer)
Wind speed:	<b>WSPD</b>	[0.1 m/s]
Clouds/WX:		N <sub>h</sub> C <sub>L</sub> hC <sub>M</sub> C <sub>H</sub> WWWW (converted to Code tables, q.v.)
		<b>PRWE</b>
		BUFR 0-20-003 (2 entries),
		<b>CLAM</b>
		BUFR 0-20-011,
	<b>CLTP</b>	BUFR 0-20-012 (3 entries),
	<b>HOCB</b>	BUFR 0-20-013
Surface obs. equipment used:		<b>SFEQP</b> 5 entries (P, T, U, DP, W) from Code Table 3-7
Surface obs. equipment:	<b>DATSIG</b>	
		horizontal distance: <b>DIST</b> 0 to 500 meters [Integer]
vertical distance:	<b>HINC</b>	-250 to +250 meters [Integer]
bearing:	<b>BEARAZ</b>	0E to 359.99E [0.01E]
from release point		
Release point pressure correction:	<b>RRPPC</b>	-50.00 to +50.00 hPa [.01 hPa = 1 Pa]
Orientation correction, azimuth:	<b>ORCRAZ</b>	-10.00 to +10.00E [0.01E]
Orientation correction, elevation:	<b>ORCREL</b>	-10.00 to +10.00E [0.01E]
Balloon shelter type:	<b>BSHEL</b>	Code Table 3-8
Balloon manufacturer:	<b>BMFGR</b>	Code Table 3-9
Balloon type:	<b>BTYPE</b>	Code Table 3-10a
Balloon weight:	<b>BWHGT</b>	300-2500 gm
Balloon lot number:	<b>BLOTN</b>	12 characters
Balloon manufacture date:	<b>DATSIG</b> Y, M, D	mm/dd/yyyy (Must be 1980 - present)
Gas type used:	<b>BGTYP</b>	Hydrogen, Helium, or Natural Gas (Code Table 3-10b)
Gas amount (nozzle lift, gm):	<b>BGAMT</b>	300 to 5000 gm (BILS ft <sup>3</sup> will be converted to gm)
Flight train length:	<b>BFTLN</b>	20.0 to 80.0 meters (Preflight 70 to 260 ft, converted to m)
Train regulator (y/n):	<b>RCONF</b>	Y or N (Flag Table 3-10c)
Light unit (y/n):	<b>RCONF</b>	Y or N (Flag Table 3-10c)
Parachute (y/n):	<b>RCONF</b>	Y or N (Flag Table 3-10c)
Rooftop release (y/n):	<b>RCONF</b>	Y or N (Flag Table 3-10c)
Data Corrections applied, if any:		
		Pressure: <b>FLPC</b> Code Table 3-11
Height:		Code Table 3-12 (unused)
		Temperature: <b>SIRC</b> Code Table 3-13
Relative Humidity:		Code Table 3-14 (unused)
Dewpoint:		Code Table 3-15 (unused)
Wind:		Code Table 3-16 (unused)
Flight termination:	<b>DATSIG</b>	
Duration:	<b>TPMI</b> , <b>TPSC</b>	hh:mm:ss
Date:	<b>TIMEST</b>	mm/dd/yyyy (UTC)

	Time:		<b>TIMEST</b> hh:mm:ss (UTC)
	Latitude:	<b>CLATH</b>	0E to 90E N/S [0.00001E] [-90E to +90E]
Longitude:		<b>CLONH</b>	0E to 180E E/W [0.00001E] [-180E to +180E]
Geopotential Height:		<b>GPH10</b>	-50 to +45,000 std. geopot. meters, above MSL
	Pressure:	<b>FLPC</b> <b>PRLC</b>	0.01 hPa to 1070.00 hPa [0.01 hPa = 1 Pa]
Temperature:	<b>SIRC</b> <b>TMDB</b>		-100.00EC to +50.00EC [0.01EC]
	RH:	<b>REHU</b>	0.0 % to 100.0 % [0.1 %]
Reason for Wind Processing Term:		<b>LEVSIG</b> <b>RTERM</b>	Code Table 3-17
Reason for Flight Term:		<b>LEVSIG</b> <b>RTERM</b>	Code Table 3-17

### 1.2.2 Time stamped raw PTU data (NC002020)

This radiosonde data may represent an average of several values over a period sample (vendor specific), thus allowing for the removal of random and systematic instrument noise. This data is not interpolated or smoothed, and is reported every 1 to 2 seconds of the flight (vendor specific).

Time Stamp:	<b>DATSIG</b> <b>TIMEST</b>	mm/dd/yyyy (UTC), hh:mm:ss.xx (UTC) [.01 seconds]
Pressure:	<b>FLPC</b> <b>PRLC</b>	0.01 hPa to 1070.00 hPa [0.01 hPa = 1 Pa], but permit extended range for erroneous P (e.g., 0.00 to 1310.73 hPa)
Temperature:	<b>SIRC</b> <b>TMDB</b>	-100.00EC to +50.00EC [0.01EC], but permit extended range for erroneous T (e.g., -273.16E to 382.19E)
Relative Humidity:	<b>RAWHU</b>	0.0 % to 100.0 % [0.1 %], but permit extended range for erroneous RH values (e.g., -100.0 % to +309.5 %)
P Quality Indicator:	<b>PCCF</b>	Integer (0 to 100, vendor-generated in the SPS)
T Quality Indicator:	<b>PCCF</b>	Integer (0 to 100, vendor-generated in the SPS)
U Quality Indicator:	<b>PCCF</b>	Integer (0 to 100, vendor-generated in the SPS)
P Quality-Control Flag:	<b>MAQC</b> <b>QCCHEK</b>	Integer (Code Table 3-19, 3-20)
T Quality-Control Flag:	<b>MAQC</b> <b>QCCHEK</b>	Integer (Code Table 3-19, 3-20)
U Quality-Control Flag:	<b>MAQC</b> <b>QCCHEK</b>	Integer (Code Table 3-19, 3-20)

### 1.2.3 Time stamped raw GPS “unsmoothed radiosonde” data (NC002021)

This radiosonde data may represent an average of several values over a period sample (vendor specific), thus allowing for the removal of random and systematic instrument noise. This data is not smoothed, and is reported every 1 to 2 seconds of the flight (vendor specific).

Time Stamp:	<b>DATSIG</b> <b>TIMEST</b>	mm/dd/yyyy (UTC), hh:mm:ss.xx (UTC) [.01 seconds]
GPS Latitude:	<b>CLATH</b>	0E to 90E N/S [0.00001E] [-90E to +90E]
GPS Longitude:	<b>CLONH</b>	0E to 180E E/W [0.00001E] [-180E to +180E]
GPS (geometric) height	<b>HEIT</b>	-50 m to +45,000 m, above MSL [Integer]
GPS u wind component	<b>UWND</b>	-200.0 to 200.0 m/s [0.1 m/s]

GPS v wind component	<b>VWND</b>	-200.0 to 200.0 m/s [0.1 m/s]
GPS velocity & position Quality Indicator	<b>PCCF</b>	Integer (0 to 100, vendor-generated in the SPS)
Lat Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
Lon Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
H <sub>geometric</sub> Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
u Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
v Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)

### 1.2.4 Time stamped raw GPS “smoothed wind” data (NC002022)

This radiosonde data may represent an average of several values over a period sample (vendor specific), thus allowing for the removal of random and systematic instrument noise. This data is smoothed in the SPS to remove the effects of erratic and pendular motion, and is reported every 1 to 2 seconds of the flight (vendor specific).

Time Stamp:	<b>DATSIG</b>	<b>TIMEST</b>	mm/dd/yyyy (UTC), hh:mm:ss.xx (UTC) [.01 seconds]
GPS Latitude:	<b>CLATH</b>		0E to 90E N/S [0.00001E] [-90E to +90E]
GPS Longitude:	<b>CLONH</b>		0E to 180E E/W [0.00001E] [-180E to +180E]
GPS (geometric) height		<b>HEIT</b>	-50 m to +45,000 m, above MSL [Integer]
GPS u wind component	<b>UWND</b>		-200.0 to 200.0 m/s [0.1 m/s]
GPS v wind component	<b>VWND</b>		-200.0 to 200.0 m/s [0.1 m/s]
GPS velocity & position Quality Indicator	<b>PCCF</b>		Integer (0 to 100, vendor-generated in the SPS)
Lat Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b>	Integer (Code Table 3-19, 3-20)
Lon Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b>	Integer (Code Table 3-19, 3-20)
H <sub>geometric</sub> Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b>	Integer (Code Table 3-19, 3-20)
u Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b>	Integer (Code Table 3-19, 3-20)
v Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b>	Integer (Code Table 3-19, 3-20)

### 1.2.5 Time stamped processed pressure, temperature, and humidity (PTU) data (NC002023)

This processed data is arrived at by applying normalization, correction, smoothing, outlier removal, and data plausibility checks to the raw PTU data provided by the radiosonde. This data is reported at the normalization interval --- once a second.

Time Stamp:	<b>DATSIG</b>	<b>TIMEST</b>	mm/dd/yyyy (UTC), hh:mm:ss.xx (UTC) [.01 seconds]
Corrected Pressure:	<b>FLPC</b>	<b>PRLC</b>	0.01 hPa to 1070.00 hPa [0.01 hPa = 1 Pa]
Smoothed Pressure:	<b>FLPC</b>	<b>PRLC</b>	0.01 hPa to 1070.00 hPa [0.01 hPa = 1 Pa]
Uncorrected Temperature:	<b>SIRC</b>	<b>TMDB</b>	-100.00EC to +50.00EC [0.01EC] (for NCEP)
Corrected Temperature:	<b>SIRC</b>	<b>TMDB</b>	-100.00EC to +50.00EC [0.01EC]
Corrected Relative Humidity:		<b>REHU</b>	0.0 % to 100.0 % [0.1 %]
Derived Dewpoint Temperature:		<b>TMDP</b>	-135.00EC to +50.00EC [0.01EC]

Derived Geopotential Height: **GPH10** -50 m to +45,000 std. geopot. m, above MSL [Integer]

P <sub>corrected</sub> Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
P <sub>smoothed</sub> Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
T <sub>uncorrected</sub> Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
T <sub>corrected</sub> Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
RH Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
Dewpoint Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
H <sub>geopotential</sub> Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)

## 1.2.6 Time stamped processed u & v winds and position data (NC002024)

This processed data is arrived at by applying normalization, outlier removal, and data plausibility checks to the raw GPS “smoothed wind” data provided by the radiosonde. This data is reported at the normalization interval --- once a second. Note that this GPS-derived wind and position data may drop out at times during the flight, but the pressure-derived geopotential height may still be available, and vice versa.

Time Stamp:	<b>DATSIG</b>	<b>TIMEST</b> mm/dd/yyyy (UTC), hh:mm:ss.xx (UTC) [.01 seconds]
Latitude:	<b>CLATH</b>	0E to 90E N/S [0.00001E] [-90E to +90E]
Longitude:	<b>CLONH</b>	0E to 180E E/W [0.00001E] [-180E to +180E]
Geometric height:	<b>HEIT</b>	-50 m to +45,000 m, above MSL [Integer]
u wind component:	<b>UWND</b>	-200.0 to 200.0 m/s [0.1 m/s]
v wind component:	<b>VWND</b>	-200.0 to 200.0 m/s [0.1 m/s]
Lat Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
Lon Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
H <sub>geometric</sub> Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
u Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)
v Quality-Control Flag:	<b>MAQC</b>	<b>QCCHEK</b> Integer (Code Table 3-19, 3-20)

## 1.2.7 Time stamped Levels data (NC002025)

This data represents the Mandatory, Significant, and other special winds and PTU levels selected from the Processed Data Set (Processed PTU and Processed Winds data).

The following parameters will be included for each level:

Time Stamp:	<b>DATSIG</b>	<b>TIMEST</b> mm/dd/yyyy (UTC), hh:mm:ss.xx (UTC) [.01 seconds]
Pressure:	<b>FLPC</b>	<b>PRLC</b> 0.01 hPa to 1070.00 hPa [0.01 hPa = 1 Pa]
Temperature:	<b>SIRC</b>	<b>TMDB</b> -100.0 to 50.0EC [0.1EC]
Relative Humidity:	<b>RENU</b>	0.0 % to 100.0 % [0.1 %]

Dewpoint Temperature:	<b>TMDP</b>	-135.0 to 50.0EC [0.1EC]
Geopotential Height:	<b>GPH10</b>	-50 m to +45,000 std. geopot. m,
		above MSL [Integer]
Geometric Height:	<b>HGHT</b>	-50 m to +45,000 m, above MSL
		[Integer]
Wind direction:	<b>WDIR</b>	1E to 360E (integer)
Wind speed:	<b>WSPD</b>	0.0 to 300.0 [0.1 m/s]
Vertical Sounding Flag:	<b>LEVSIG</b>	Code Table 3-18, indicating
		Met/Wind Level type/signif.

### 1.3 Tables

Code	Meaning
0-50	Defined or Reserved
51	VIZ-B2 (USA)
52	Vaisala RS80-57H
53-86	Defined or Reserved
87	Sippican Mark IIA with chip thermistor, pressure
88-254	Defined or Reserved
255	Missing value

**Table 1. Radiosonde Type (existing 0-02-011, C-2, RATP)**

Code	Meaning
0	Capacitance aneroid
1	Derived from GPS
2	Resistive strain gauge
3-29	Reserved
30	Other
31	Missing value

**Table 2. Type of pressure sensor (new 0-02-095, PSENS)**

Code	Meaning
0	Rod thermistor
1	Bead thermistor
2	Capacitance bead
3-29	Reserved
30	Other
31	Missing value

**Table 3. Type of temperature sensor (new 0-02-096, TSENS)**

Code	Meaning
0	VIZ Mark II Carbon Hygristor
1	VIZ B2 Hygristor
2	Vaisala A-Humicap
3	Vaisala H-Humicap
4	Capacitance sensor
5	Vaisala RS90
6	Sippican Mark IIA Carbon Hygristor
7-29	Reserved
30	Other
31	Missing value

**Table 4. Type of humidity sensor (new 0-02-097, RHSENS)**

Code	Meaning
0	TRS-2000
1	IMS-1500C
2-61	Reserved
62	Other
63	Missing value

**Table 5. Radiosonde ground receiving system (new 0-02-066, RGRSY)**

Code	Meaning
0	No windfinding
1	Automatic with auxiliary optical direction finding
2	Automatic with auxiliary radio direction finding
3	Automatic with auxiliary ranging
4	Not used
5	Automatic with multiple VLF-Omega signals
6	Automatic with cross chain Loran-C
7	Automatic with auxiliary wind profiler
8	Automatic satellite navigation (GPS)
9-18	Reserved
19	Tracking technique not specified
20-126	ASAP technique/status entries
127	Missing value

**Table 6. Tracking technique (existing 0-02-014, C-7, TT SS)**

Code	Meaning
0	PDB
1	RSOIS
2	ASOS
3	Psychrometer
4	F420
5-29	Reserved
30	Other
31	Missing value

**Table 7. Type of surface observing equipment (new 0-02-115, SFEQP)**

Code	Meaning
0	High bay
1	Low bay
2	BILS
3	Roof-top BILS
4-13	Reserved
14	Other
15	Missing value

**Table 8. Type of balloon shelter (new 0-02-083, BSHEL)**

Code	Meaning
0	Kaysam
1	Totex
2	KKS
3-61	Reserved
62	Other
63	Missing value

**Table 9. Balloon manufacturer (new 0-02-080, BMFGR)**

Code	Meaning
0	GP26
1	GP28
2	GP30
3	HM26
4	HM28
5	HM30
6	SV16
7-29	Reserved
30	Other
31	Missing value

**Table 10. Type of balloon (new 0-02-081, BTYPE)**

Code	Meaning
0	Hydrogen
1	Helium
2	Natural Gas
3-14	Reserved
15	Missing value

**Table 11. Type of gas used in balloon (new 0-02-084, BGTYP)**

Bit	Meaning
1	Train regulator
2	Light unit
3	Parachute
4	Rooftop release
All 5	Missing value

**Table 12. Radiosonde configuration (new 0-02-016, RCONF)**

Bit	Meaning
1	Smoothed
2	Baseline adjusted
3	Normalized time interval
4	Outlier checked
5	Plausibility checked
6	Consistency checked
7	Interpolated
All 8	Missing value

**Table 13. Pressure Corrections (new 0-25-069, FLPC)**

Code	Meaning
TBD	TBD

**Table 14. Height Corrections (unused, undefined)**

Code	Meaning
0	No correction
1-3	CIMO
4	Solar and infrared corrected by radiosonde system
5	Solar corrected by radiosonde system
6-7	corrected as specified by country
8-14	Reserved
15	Missing value

**Table 15. Temperature Corrections (existing 0-02-013, SIRC)**

Code	Meaning
TBD	TBD

**Table 16. Relative Humidity Corrections (unused, undefined)**

Code	Meaning
TBD	TBD

**Table 17. Dewpoint Corrections (unused, undefined)**

Code	Meaning
TBD	TBD

**Table 18. Wind Corrections (unused, undefined)**

Code	Meaning
0	Reserved
1	Balloon burst
2	Balloon forced down by icing
3	Leaking or floating balloon
4	Weak or fading signal
5	Battery failure
6	Ground equipment failure
7	Signal interference
8	Radiosonde failure
9	Excessive missing data frames
10	Reserved
11	Excessive missing temperature
12	Excessive missing pressure
13	User terminated
14-29	Reserved
30	Other
31	Missing value

**Table 19. Reason for termination (new 0-35-035, RTERM)**

Code	Meaning
0 *	High resolution data sample
1	Within 20 hPa of surface
2	Pressure less than 10 hPa (i.e., 9, 8, 7, etc.) when no other reason applies
3	Base pressure level for stability index
4 *	Begin doubtful temperature, height data
5 *	Begin missing data (all elements)
6	Begin missing RH data
7	Begin missing temperature data
8	Highest level reached before balloon descent because of icing or turbulence
9 *	End doubtful temperature, height data
10 *	End missing data (all elements)
11	End missing RH data
12	End missing temperature data
13	Zero degrees C crossing(s) for RADAT
14	Standard pressure level
15	Operator added level
16	Operator deleted level
17	Balloon re-ascended beyond previous highest ascent level
18	Significant RH level ( per WMO criteria)
19 *	RH level selection terminated
20	Surface level
21	Significant temperature level ( per WMO criteria)
22 *	Mandatory temperature level
23	Flight termination level
24	Tropopause(s)
25 *	Aircraft report
26 *	Interpolated (generated) level
27 *	Mandatory wind level
28	Significant wind level
29	Maximum wind level
30	Incremental wind level (fixed regional)
31 *	Incremental height level (generated)
32	Wind termination level
33	Pressure 100 to 110 hPa, when no other reason applies
34-39 *	Reserved
40 *	Significant thermodynamic level (inversion)
41 *	Significant RH level ( per NCDC criteria)

42 *	Significant temperature level (per NCDC)
43	Begin missing wind data
44	End missing wind data
45-61 *	Reserved
62 *	Other
63 *	Missing value

**Table 20. RRS flight level significance (new 0-08-040, LEVSIG)**

\* Not currently used in RRS

Code	Meaning	RRS
0	Automatic QC passed; not manually checked	0
1	Automatic QC passed; manual QC passed	
2	Automatic QC passed; manual QC deleted	4
3	Automatic QC failed; not manually checked	2
4	Automatic QC failed; manual QC deleted	6
5	Automatic QC failed; manual QC re-inserted	
6	Automatic QC questionable; not manually checked	1
7	Automatic QC questionable; manual QC deleted	5
8	Manual QC failed	
9-14	Reserved	
15	Missing value	3,7

**Table 21. RRS Data Quality-Check Mark, maps to Manual/Automatic Quality Control (existing 0-33-035, MAQC)**

Code	Meaning
0	Passed all checks
1	Missing-data check
2	Descending/reascending balloon check
3	Data plausibility check (above limits)
4	Data plausibility check (below limits)
5	Superadiabatic lapse rate check
6	Limiting angles check
7	Ascension rate check
8	Excessive change from previous flight
9	Balloon overhead check
10	Wind speed check
11	Wind direction check
12	Dependency check
13	Data valid but modified
14	Data outlier check
15-62	Reserved
63	Missing value

**Table 22. RRS Data Quality-Check Indicator (new 0-33-015, QCCHEK)**

Supplemental Table used

Code	Meaning
0	parent site
1	observation site
2	Balloon manufacture date
3	Balloon launch point
4	Surface observation
5	Surface observation displacement from launch point
6	Flight level observation
7	Flight level termination point
8-30	Reserved
31	Missing value

**Table 23. RRS data significance (new 0-08-041, DATSIG)**

## **2.0 MicroART File Formats**

The following information details the MicroART File Formats necessary for NCDC Archive.

## 2.1 Background

This document describes the data format that the National Weather Service (NWS) uses to deliver radiosonde observations to the National Climatic Data Center (NCDC). The National Weather Service radiosonde ground system equipment formats each sounding, intended for relay to the NCDC, as two files, an identification file and a sounding data file. The Identification file has one 160 character record containing date and time of flight, station and equipment metadata, and surface weather parameters at the time of balloon release. The file naming convention for Identification files is H plus ascension number from the first of the year. The Data File contains a variable number of 80 character records, each containing data for one reported level. Data records contain flight ascension number, elapse time since release, layer type, observed elements, and data quality indicators. The naming convention for Data Files is T plus ascension number from first of the year.

NWS field personnel copy data files from the upper air pc to another pc with internet access via diskette or file transfer cable and software, and transmit to NCDC via File Transfer Protocol (FTP) or e-mail attachment at the end of each month. The NCDC transcribes all incoming flight files to the NCDC upper-air quality control system to produce a digital archive. The NCDC upper-air data archive contains all original data and quality indicators generated by NCDC automated and interactive quality control process.

# Identification File

RECORD POSITION	ELEMENT NAME	CODE DEFINITIONS AND REMARKS
1	STN-IND	STATION NUMBER INDICATOR - This field contains an indicator specifying the type of station number in the next field:
0 = WBAN NUMBER 1 = WMO NUMBER 2 = AIR FORCE AUGMENTED WMO NUMBER 3 = SHIP CALL SIGN 4 = MOBILE UNIT CALL SIGN		
2-9	STN NUM	STATION NUMBER - The number assigned to the station according to the numbering system specified in record position 1. Numbers should be right justified with leading blanks, ship CALL signs left justified with trailing blanks. NWS stations must enter WBAN number. If the number is missing, enter "00000000".
10-14	LAT	LATITUDE - The station latitude in degrees and minutes. The last character is "N" or "S" as appropriate. When unknown, this field contains "9999N".
15-20	LONG	LONGITUDE - The station longitude in degrees and minutes. The last character is "E" or "W" as appropriate. When unknown, this field contains "99999E".
21-24 site	ELEV	ELEVATION - The height of the launch site in whole meters.
25-28	YEAR	YEAR - The 4-digit year expressed at the hour of observation (UTC).
29-30	MONTH	MONTH - The numeric month expressed at the hour of observation (UTC).

31-32	DAY	DAY - The numeric day expressed at the hour of observation (UTC).
33-34	HOUR	HOUR - The hour (24-hour clock) of observation (UTC). For synoptic hours (H=00, 06, 12, 18) the hour of observation will be H whenever the actual release time is H-30 to H+29. For example, the synoptic hour will be entered as 12 when the actual release is from 1130 to 1229 UTC. For regular synoptic observations the actual release should occur as close as possible to H-30. For non-synoptic hours, the hour of observation will be the nearest whole hour, H-30 to H+29 (e.g. the hour is entered as 10 when release is 0930 to 1029 UTC).
35-38	RELSE TIME	TIME OF ACTUAL RELEASE - The hour and minute UTC (24-hour clock) of the actual release time.
39-42	ASCN NUM	ASCENSION NUMBER - The ascension number for the year. The first release on or after Jan 1 will be numbered 0001. Ascension numbers are right-justified with leading zeros.
43-46	OBSVR INIT	OBSERVER INITIALS - The initials of the first and last name of the observer.
47-49	DTA RDC SYS	DATA REDUCTION SYSTEM - The type of data reduction system used at the site.

001 = MANUAL  
 002 = TIME-SHARE  
 003 = NOVA MINI COMPUTER  
 004 = MINI-ART  
 005 = MICRO-ART

007 = MARWIN, MRS  
 008 = MSS  
 009 = LAMS  
 010 = ASAP  
 011 = MV 7800  
 012 = AIR MET **RESEARCH** RAWIN SYSTEM  
 013 = VIZ **W-9000** Meteorological Processing System (DOS based)  
**014 = RRS**  
 018 = **ATIR**  
**019 = InterMet 1500**  
**020 = WIN9000 (Software for LMG6 System) Windows based**

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50-52            SONDE MAN      SONDE MANUFACTURER - The manufacturer of  
                                          the Sonde in use.

001 = VIZ  
 002 = VAISALA  
 003 = SPACEDATA  
 004 = AIR  
 005 = ATIR  
 006 = Sippican  
**007 = InterMet**  
**008 = Lockheed Martin Sippican (LMS)**

---

53-55            SONDE TYP      SONDE TYPE - The type of Sonde used at  
                                          the station.

001 = VIZ J031  
 002 = VIZ ACCU-LOC  
 003 = VIZ A  
 004 = VIZ B  
 005 = VIZ MSS  
 006 = SPACEDATA-TRANSPONDER  
 007 = SPACEDATA-ARTSONDE  
 008 = SPACEDATA-MSS  
 009 = VAISALA RS80(version unknown)  
 010 = VIZ B mod. 1492-520 (1680/403MHz)- TRANSPONDER  
 011 = AIR INTELLISONDE  
 012 = VIZ Mark II MICROSONDE  
 013 = VIZ C mod. 1492-530 (1680 MHz) Accu Lok 014-019 reserved  
 020 = VAISALA RS80-15N Navy MRS (OMEGA Navaid windfinding)  
 021 = VAISALA RS80-15P (OMEGA Navaid windfinding)  
 022 = VAISALA RS80-15L (Loran-C Navaid windfinding)  
 ...  
 038 = VAISALA RS80-56 (Radio Direction Finding(RDF), 1680 MHz)-

pressure cell  
 039 = VAISALA RS80-57 (RDF, 1680 MHz)  
 040-044 reserved  
 045 = Sippican HRFE  
 046 = Sippican LRFE  
 ...  
 489 = VIZ B-2 (RDF, 1680 MHz) capacitance aneroid pressure  
 sensor  
 ...  
 500 = Mark IIA Sippican GPS 1680 MHz with aneroid pressure cell  
 and carbon element RH  
 501 = InterMet GPS  
 502 = LMS6 Lockheed Martin Sippican 403 MHZ GPS radiosonde with  
 capacitive RH sensor and derived pressure from GPS height

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56	SON/BAR IND	SONDE/BAROSWITCH NUMBER INDICATOR - An indicator specifying the type of number in the next field.
----	----------------	---------------------------------------------------------------------------------------------------------

0 = SONDE SERIAL NUMBER  
 1 = BAROSWITCH NUMBER

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57-76	SON/BAR NUM	SONDE/BAROSWITCH - The Sonde serial number or the Baroswitch number right justified in the field, with leading blanks . This "number" probably will include non-numeric characters.
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77-79	HUM TYP	HUMIDITY TYPE - Type of humidity element used in the system.
-------	---------	-----------------------------------------------------------------

001 = Lithium Chloride Hygristor  
 002 = 1960's Carbon Hygristor  
 003 = 1980's Carbon Hygristor  
 004 = Humicap  
 005 = H-Humicap  
 006 = VIZ Mark II carbon hygristor  
 007 = Capacitance sensor  
 008 = Sippican Mark IIA Carbon Hygristor  
 009 = LMS6 thin film capacitance humidity sensor

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80-82	TEMP TYP	TEMPERATURE TYPE - Type of temperature element used in the system.
-------	----------	-----------------------------------------------------------------------

001 = Rod Thermistor

002 = Bead Thermistor  
003 = Chip Thermistor  
004 = Capacitive Bead

-----  
83-85            PRESS TYP    PRESSURE TYPE - Type of pressure element  
                                 used in the system.

001 = Baroswitch  
002 = Transducer - oven controlled  
003 = Transducer - non-oven controlled  
004 = Derived (Transponder)  
005 = Capacitive Aneroid  
**006 = Resistive strain gauge**  
**007 = Pressure derived from differential GPS geometric height**

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86-88	TRK TYP	TRACKING TYPE - The type of tracking system.
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001 = 72-2	010 = LORAN
002 = SCR-658	011 = ART-1
003 = WBRT-57	012 = ART-1R
004 = WBRT-60	013 = ART-2
005 = GMD-1	014 = ART-2R
006 = GMD-1A	015 = MDS
007 = GMD-1B	016 = MSS RANGING
008 = GMD-5	017 = RADIO THEODOLITE
009 = OMEGA	<b>018 = Global Positioning System (GPS)</b>

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89	TRNSP	TRANSPONDER - is a transponder used.
----	-------	--------------------------------------

  

0 = No  
1 = Yes

---

90-92	BAL MAN	BALLOON MANUFACTURER - The manufacturer of the balloon.
-------	---------	---------------------------------------------------------

  

001 = KAYSAM  
002 = WEATHERTRONICS  
003 = KKS  
004 = Totex  
999 = Other

---

93-96	BAL WGT/ TYP	BALLOON WEIGHT/TYPE - Nominal weight of the balloon in grams or balloon type as follows:
-------	-----------------	------------------------------------------------------------------------------------------

  

0001 = GP26  
0002 = GP28  
0003 = GP30  
0004 = HM26  
0005 = HM28  
0006 = HM30  
0007 = SV16  
**9999 = Other**

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97-98	BAL AGE	BALLOON AGE - Age of the balloon in months.
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  99          TRN REG      TRAIN REGULATOR - Was a train regulator
                        used
N = No
Y = Yes
-----
 100          PBL LGT      PIBAL LIGHT - Was a PIBAL light used

N = No
Y = Yes
-----
 101          PBL TYP      PIBAL TYPE - PIBAL wind equipment type
                        according to WMO Code Table 0265.

0 = Pressure instrument associated with wind-measuring equipment
1 = Optical Theodolite
2 = Radio Theodolite
3 = Radar
8 = Satellite Navigation (or GPS)
-----
102-103       REASON       REASON FOR TERMINATION - Reason for
                TERMN      termination of the flight:

01 = Balloon burst
02 = Balloon forced down by icing
03 = Leaking or floating balloon
04 = Weak or fading signal
05 = Battery failure
06 = Ground equipment failure
07 = Signal interference
08 = Radiosonde failure
09 = Excessive missing data
10 = Other
-----
 104          NUM RCP      RECOMPUTES - The number of times this
                        flight has been recomputed.

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-----  
105-113        CLOUDS-WX        CLOUDS AND WEATHER - The observation  
of

the clouds and weather at the time of  
release. The field is of the form  
 $N_h C_L h C_M C_H WWWW$ , where:

$N_h$  = The amount of low or mid-level clouds present according to  
WMO Code Table 2700.

0 = 0 okta (tenths)  
1 = 1 okta (1/10) or less, but not zero  
2 = 2 oktas (2/10-3/10)  
3 = 3 oktas (4/10)  
4 = 4 oktas (5/10)  
5 = 5 oktas (6/10)  
6 = 6 oktas (7/10-8/10)  
7 = 7 oktas (9/10) or more, but not overcast  
8 = 8 oktas (10/10)  
9 = Sky is obscured by fog and/or other meteorological phenomena  
- = Cloud cover is indiscernible for reason other than "9" or  
observation not made. The WMO code figure "/" must be  
converted to "-".

$C_L, C_M, C_H$  = The cloud type according to WMO Code Tables 0509,  
0513, and 0515. Code figure "/" must be converted to  
"-".

$h$  = WMO Code Table 1600 for the height above ground of the base  
of the lowest cloud seen. Code figure "/" must be  
converted  
to "-".

WW = Present weather according to WMO Code Table 4677. Up to  
two  
types of present weather or obscurations may be entered.  
If  
present weather is not observed, enter "////" in this field  
(WWWW).

-----  
114-116        SFCWND DIR        SURFACE WIND DIRECTION - The direction  
of

the surface wind at time of release in  
whole degrees.  
-----

meters

-----  
120-122        WIND AVE        WIND AVERAGING INTERVAL - The interval  
                 INT        of time or height over which the wind is  
                              derived.

000 = None (instantaneous)  
001 = Two mins. to 14km (MSL), four mins. above 14km (MSL).  
      (Pre-1990 FMH Standard, NWS)  
002 = Post-1989 FMH Standard  
003 = 20 seconds to 15K ft., 60 seconds above 15K ft.  
004 = 30 seconds up to 2500m AGL,  
      45 seconds up to 5000m AGL,  
      60 seconds up to 7500m AGL,  
      75 seconds up to 10 km AGL,  
      90 seconds up to 15 km AGL,  
      105 seconds up to 20 km AGL,  
      120 seconds above 20 km AGL.  
005 = Four mins. for the entire flight  
006 = Two mins. for the entire flight  
007 = Variable  
**008 = One Minute smoothing**

-----  
123-134        CORTYP        TYPE OF CORRECTION - The type of  
                              correction applied to individual data  
                              elements by automated systems or  
                              observers.

-----  
123-124        CORTYP-P       PRESSURE CORRECTIONS

00 = No correction applied  
01 = NASA temperature correction  
02 = EMCWF temperature correction  
...  
...  
88 = Unknown

-----  
125-126        CORTYPE-Z       HEIGHT CORRECTIONS

00 = No correction applied  
01 = Local gravity correction  
02 = Standard gravity correction  
...  
...  
88 = Unknown

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127-128        CORTYP-T        TEMPERATURE CORRECTIONS

00 = No correction applied  
01 = NASA radiation correction  
02 = EMCWF radiation correction  
03 = NMC radiation correction  
04 = Vaisala RSN-93 solar and infrared radiation correction  
...  
...  
11 = NASA lag correction  
12 = EMCWF lag correction  
13 = NMC lag correction  
...  
...  
21 = NASA radiation and lag correction  
22 = EMCWF radiation and lag correction  
23 = NMC radiation and lag correction  
...  
...  
88 = Unknown  
**89 = Sippican W-9000 Solar Correction**  
**90 = Sippican Solar and Infrared**  
**91 = InterMet Solar and Infrared**  
**92 = LMS WIN9000 Solar Correction**

---

129-130        CORTYP-H        HUMIDITY CORRECTIONS

00 = No corrections applied  
01 = NASA lag correction  
02 = EMCWF lag correction  
03 = NMC lag correction  
...  
...  
88 = Unknown

---

131-132        CORTYP-TD        DEW POINT CORRECTIONS

00 = No corrections applied  
01 = NASA lag correction  
02 = EMCWF lag correction  
03 = NMC lag correction  
...  
...  
88 = Unknown

-----  
133-134        CORTYP-W        WIND CORRECTIONS

00 = No corrections applied  
01 = Elevation angle correction  
02 = Ranging correction  
...  
...  
88 = Unknown

NOTE:        At this writing, the types of corrections which may be applied to the data have not been determined. Input from various agencies will be used to develop initial codes and correction types.

-----  
135-144        SOFT VER        SOFTWARE VERSION - The version of software in use with the specified recording system. Enter the software version left-justified with trailing blanks.

-----  
145-160        RES FLD        RESERVED FIELD - Leave blank  
-----

# DATA RECORD

RECORD POSITION	ELEMENT NAME	CODE DEFINITIONS AND REMARKS
1-4	ASCN NUM	ASCENSION NUMBER - The ascension number for the year. The first release on or after Jan 1 will be numbered 0001.
5-9	ELPSD TIME	ELAPSED TIME - The time in minutes and seconds (mmmss) since the actual release time.
10-15	PRESS	PRESSURE - Atmospheric pressure at the current level in hundredths of hectopascals (0.01 millibars).
16-20	HGT	HEIGHT - Geopotential height of the pressure level in whole geopotential meters. (MSL)
21-24	TEMP	TEMPERATURE - Dry-bulb temperature to the nearest 0.1 degree Celsius.
25-28	REL HUM	RELATIVE HUMIDITY - The relative humidity to the nearest 0.1 percent.
29-31	DPDP	DEW POINT DEPRESSION - The dew-point depression to the nearest 0.1 degree Celsius
32-34	WIND DIR	WIND DIRECTION - The wind direction to the nearest whole degree.
35-38	WND SPD	WIND SPEED - Wind speed to the nearest 0.1 meter per second.
39-40	TYP LEVEL	TYPE OF LEVEL - The reason for selection of the level:

00 = High resolution data sample  
 01 = Within 20 hectopascals (mb) of the surface  
 02 = Pressure less than 10 hectopascals (mb)

03 = Base pressure level for stability index  
 04 = Begin doubtful temperature, altitude data  
 05 = Begin missing data (all elements)  
 06 = Begin missing relative humidity data  
 07 = Begin missing temperature data  
 08 = Highest level reached before balloon descent because of  
       icing or turbulence.  
 09 = End doubtful temperature, altitude data  
 10 = End missing data (all elements)  
 11 = End missing relative humidity data  
 12 = End missing temperature data  
 13 = Zero degree crossing for the RADAT  
 14 = Mandatory pressure level  
 15 = Operator added level  
 16 = Operator deleted level  
 17 = Balloon re-ascended beyond previous highest level  
 18 = Significant relative humidity level  
 19 = Relative humidity level selection terminated  
 20 = Surface level  
 21 = Significant temperature level  
 22 = Mandatory temperature level  
 23 = Flight termination level  
 24 = Tropopause  
 25 = Aircraft report  
 26 = Interpolated (generated) level  
 27 = Mandatory wind level  
 28 = Significant wind level  
 29 = Maximum wind level  
 30 = Incremental wind level (e.g., 1-minute, fixed regional)  
 31 = Incremental height level (generated)  
**32 = Wind termination level**  
**33 = Pressure 100 to 110 hectopascals, when no other reason**  
**applies.**  
 ...  
 ...  
 40 = Significant thermodynamic level (reason for selection  
       unknown)  
**41 = Significant relative humidity level, using NCDC criteria.**  
**42 = Significant temperature level, using NCDC criteria.**  
**43 = Begin missing wind data.**  
**44 = End missing wind data.**

---

41-43	SQP	SIGNAL QUALITY - Signal quality for the element(Pressure) expressed as a percentage of individual samples
-------	-----	-----------------------------------------------------------------------------------------------------------------

accepted.

44-46	SQT	(Temperature)
47-49	SQU	(Humidity)
50-52	SQD	(Dew-point temperature)

53-54	EQET	ELEMENT QUALITY FLAGS - These fields contain the results (Elapsed Time) of any quality control procedures for identifying suspect and doubtful individual elements:
55-56	EQP	(Pressure/Ranging)
00 = Element is correct		
01 = Element is suspect		
57-58	EQH	(Height)
02 = Element is doubtful		
03 = Element failed QC checks		
04 = Replacement value (correction)		
59-60	EQT	(Temperature)
05 = Estimated value		
06 = Observer edited value		
09 = Element not checked		
61-62	EQU	(Humidity)
63-64	EQD	(Dew-point depression)
65-66	EQWD	(Wind direction)
67-68	EQWS	(Wind speed)
69-80	RES FLD	RESERVED FIELD Leave Blank

The data records are repeated as many times as necessary to record all levels of the flight. All fields must be right-justified (least significant digit in the rightmost position) unless specified otherwise. All missing fields must be 9 filled unless specified otherwise. Do not enter decimal points. The decimal point is implied by the field position.